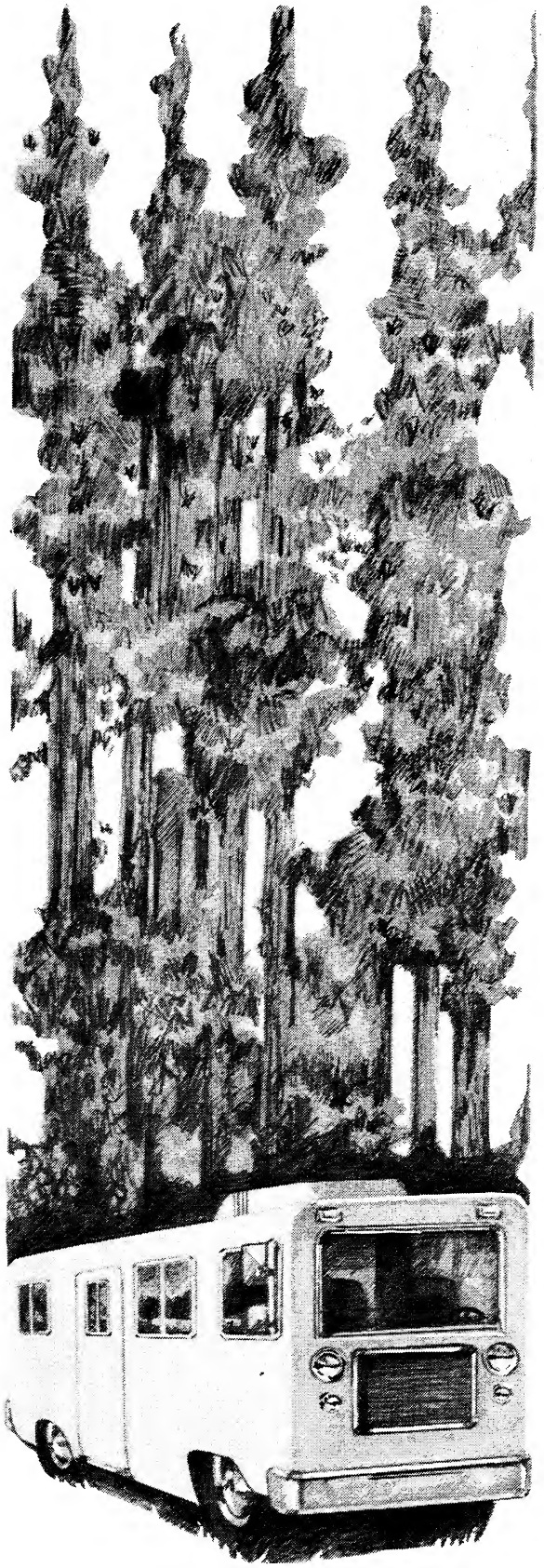
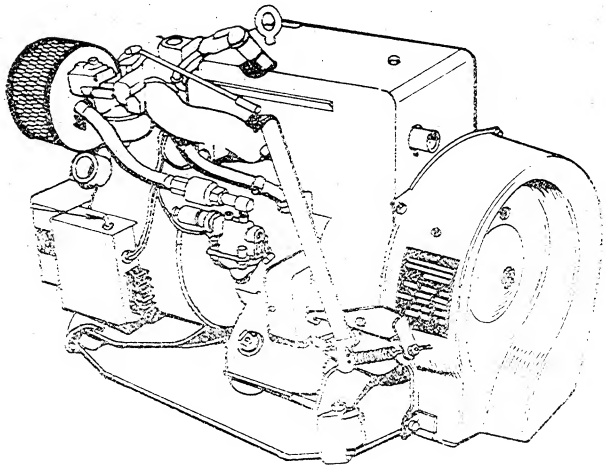
operator's manual



Onan®

2.7 AJ

R.V. Electric Generating Sets



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SAFETY PRECAUTIONS

The following symbols in this manual signal potentially dangerous conditions to the operator or equipment. Read this manual carefully. Know when these conditions can exist. Then, take necessary steps to protect personnel as well as equipment.

WARNING **Onan uses this symbol throughout this manual to warn of possible serious personal injury.**

CAUTION **This symbol refers to possible equipment damage.**

Fuels, electrical equipment, batteries, exhaust gases and moving parts present potential hazards that could result in serious, personal injury. Take care in following these recommended procedures.

- **Use Extreme Caution Near Gasoline. A constant potential explosive or fire hazard exists.**

  Do not fill fuel tank near unit with engine running. Do not smoke or use open flame near the unit or the fuel tank.

  Be sure all fuel supplies have a positive shutoff valve.

  Fuel lines must be of steel piping, adequately secured and free of leaks. Use a flexible section of fuel line between generator set and stationary fuel line in the vehicle. This flexible section must be 100% NON-METALLIC to prevent electrical current from using it as a conductor.

  Have a fire extinguisher nearby. Be sure extinguisher is properly maintained and be familiar with its proper use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.

- **Guard Against Electric Shock**

  Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.

  Jewelry is a good conductor of electricity and should be removed when working on electrical equipment.

  Always use an appropriately sized, approved double-throw transfer switch with any standby generator set. DO NOT PLUG PORTABLE OR STANDBY SETS DIRECTLY INTO A HOUSE RECEPTACLE TO PROVIDE EMERGENCY POWER. It is possible for current to flow from generator into the utility line. This creates extreme hazards to anyone working on lines to restore power.

  Use extreme caution when working on electrical components. High voltages cause injury or death.

  Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician.

- **Do Not Smoke While Servicing Batteries**

  Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

- **Exhaust Gases Are Toxic**

  Provide an adequate exhaust system to properly expel discharged gases. Check exhaust system regularly for leaks. Ensure that exhaust manifolds are secure and not warped.

  Be sure the unit is well ventilated.

- **Keep The Unit And Surrounding Area Clean**

  Remove all oil deposits. Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and subsequent engine damage and may present a potential fire hazard.

  Do NOT store anything in the generator compartment such as oil cans, oily rags, chains, wooden blocks etc. A fire could result or the generator set operation may be adversely affected. Keep the floor clean and dry.

- **Protect Against Moving Parts**

  Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be permitted because of the danger of becoming caught in moving parts.

  Make sure all nuts and bolts are secure. Keep power shields and guards in position.

  If adjustments *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

  Do not work on this equipment when mentally or physically fatigued.

TO THE OWNER

Welcome to the growing family of *Onan Power users* . . . We are proud to have you as a customer.

Read this manual carefully and observe all safety rules within. Operating instructions, adjustments and periodic maintenance procedures are given so that you . . . the owner, can keep your unit running like new and expect many years of dependable service from it. Remember . . . any machine, regardless of design or type, will perform only in relation to the services it receives.

If your generator set needs special attention, ask your Onan dealer for assistance; the Onan Parts and Service Organization has been factory-trained to provide up-to-date know-how for keeping your RV electric generating set "on the road". A complete Parts Catalog is available at nominal cost and may be ordered under #924-0220.

TABLE OF CONTENTS

WARNING

TO PREVENT FIRE OR ACCIDENT HAZARD . . . THIS UNIT MUST BE INSTALLED ACCORDING TO THE MANUFACTURER'S DETAILED INSTALLATION PROCEDURES OBSERVING ALL MINIMUM CLEARANCES.

TO AVOID POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, ANY INSTALLATION AND ALL SERVICE MUST BE PERFORMED BY QUALIFIED PERSONNEL.

GENERAL INFORMATION

YOUR MANUAL

This manual contains operation and other information to properly maintain, service, and make adjustments on your AJ generator set. Study and follow the instructions carefully. A well-planned service and maintenance program will result in longer unit life and better performance. Because the most important part of repair is diagnosis, a troubleshooting chart is included.

Throughout the manual, engine end of the generator set is the front. Left and right sides are determined when facing the engine (front) end.

When contacting your Onan dealer, distributor, or the factory about the generator set, always supply the complete model number and serial number as shown on the nameplate (see *Model Designation* following). This information is necessary to identify your generator set among the many types manufactured by Onan.

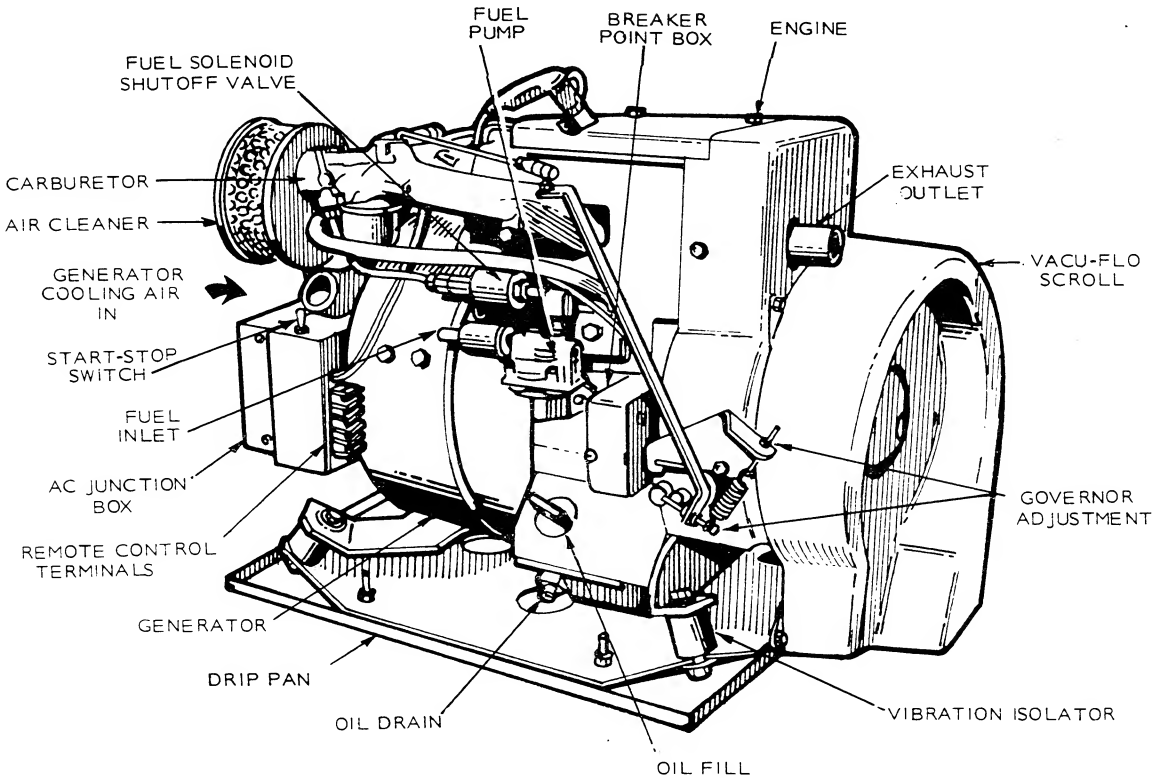
MODEL DESIGNATION

The following typical model number is broken down into code segments used by Onan.

2.7 AJ - 1 R 16016 N

1 2 3 4 5 6

1. Indicates kilowatt rating.
2. Series identification.
3. Voltage code of the generator, 1 = 120 volts.
4. Method of starting:
   R—Remote electric starting.
5. Factory code for designating optional equipment, if any.
6. Specification letter which advances when the factory makes production modifications.



TYPICAL AJ RECREATIONAL VEHICLE GENERATOR SET

SPECIFICATIONS

This manual contains SI metric equivalents that follow immediately in parentheses after the U.S. customary units of measure.

GENERAL

Nominal Dimensions of Set	
Height	15.69 in. (399 mm)
Width	12 in. (305 mm)
Length	22.16 (566 mm)
Weight	147 lbs. (67 kg)

ENGINE DETAILS

Manufacturer	ONAN
Number of Cylinders	One
Displacement (cubic inches)	14.9 (244.21 cc)
Cylinder Bore	2-3/4 in. (69.85 mm)
Piston Stroke	2-1/2 in. (63.50 mm)
Compression Ratio	6.25:1
Engine Speed	3600 RPM
Engine Design	Four Cycle, Air Cooled, L Head
Starting System	Exciter Cranking Generator

GENERATOR DETAILS

Manufacturer	ONAN
Design	Revolving Armature, Two Pole, Inherently Regulated, 3600 RPM
Rating (in watts) 60 Hertz	2750 Watts (2.7 kW)
Voltage	120
Current Rating	23 Amperes
Phase	Single
Wire	Two
Power Factor	1.0
Cranking Current	40 Amps
Break-away Current	225 Amps

CAPACITIES AND REQUIREMENTS

Oil Capacity	1.1 qts. (1.04 litres)
Recommended Battery, Electric Start	12 Volt, 92 Amp/hr (331.20 kC)
Battery Charge Rate—Fixed	1-1/2 Amps
Ventilation Requirements (total)	75 sq. in. (487 cm^2)

TUNE-UP SPECIFICATIONS

Spark Plug Gap	.025 (0.64 mm)
Breaker Point Gap (cold setting)	.022 (0.56 mm)
Ignition Timing Reference (cold setting)	22° BTC
Valve Tappet Adjustment (engine cold)	
Intake	.011 (0.28 mm)
Exhaust	.018 (0.46 mm)

INSTALLATION CHECKS

INSTALLATION

Nearly all Onan electric generating sets are installed by the motor home manufacturer. Although the manufacturer must follow safety codes when installing, certain installation problems could arise after the unit is installed and subjected to vibration. There are a few areas that you as the operator should be concerned with. If in doubt about any aspect of your generator set's operation or safety, contact your nearest authorized Onan Service Center. A daily inspection of your installation should include the following:

- Exhaust
- Fuel System
- Electrical
- Ventilation

EXHAUST

Check for leaks around manifolds, gaskets and welds. Make sure exhaust lines are not heating surrounding areas excessively. If so, have corrected immediately. Remember EXHAUST GASES CONTAIN DEADLY CARBON MONOXIDE. Be sure all holes to the inside of RV from set compartment are sealed to prevent poisonous exhaust gases from entering vehicles.

FUEL SYSTEM

With set running, check for leaks. Raw fuel will cause fumes which could EXPLODE. Check around carburetor and fuel pump inlets. Make sure fuel lines are not rubbing against anything which could cause breakage.

Inlet on fuel pump filter requires a 9/32-inch I.D. hose and a separate clamp.

ELECTRICAL

AC Output

Two AC leads, M1 (hot) and M2 (ground), terminate in generator junction box. These wires should be connected to distribution box with multistrand wire (no smaller than No. 16) enclosed in a flexible conduit. Check all wires (to and from the generator set) for fraying and loose connections.

Battery Connections

Battery positive (+) connection connects to start solenoid. Battery negative connects to location on rear of generator. Check terminals on set and battery for clean and tight connections.

Grounding

Generator must be effectively bonded to recreational vehicle chassis.

For additional information on installation, contact your Onan Service Representative or request *CSA Installation Guide 924-0610.*

VENTILATION

The biggest enemy of electric generating sets installed in motor homes is excessive heat. Make sure the set's air inlet and outlet are not plugged with dust, dirt, bugs, leaves or anything that could restrict cooling air.

WARNING **Do not use discharged cooling air for compartment heating since it could contain poisonous exhaust gases.**

WARNING **Insulation must not reduce the minimum clearances as specified in Figure 1 to meet ANSI 198.1 AND CSA #946 temperature rise requirements for recreational vehicles.**

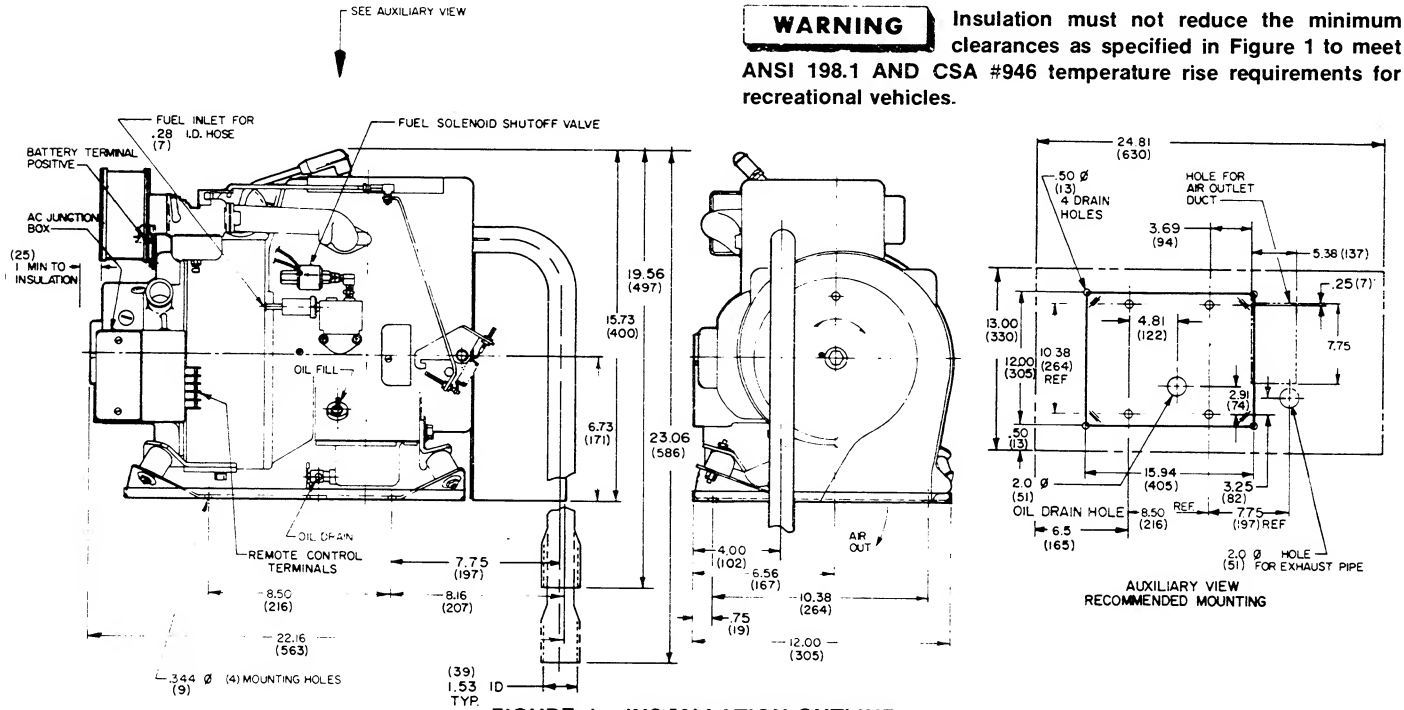


FIGURE 1. INSTALLATION OUTLINE

OPERATION

GENERAL

The unit may be tilted during operation to any maximum angle not exceeding vehicle operation limitations.

Rust inhibitor oil has been placed in the engine combustion chamber at the factory and may foul the spark plug. If the plug should foul, remove it and clean thoroughly. Then dry and replace in engine.

RECOMMENDED FUEL

All Onan AC electric generating sets for recreational vehicles use gasoline fuel. Because any AC electric generating set runs at a constant speed, lead deposits tend to build up in the combustion chambers. For this reason, use clean, fresh, lead free or low-lead gasoline. Regular grade gasoline may also be used, but DO NOT use highly leaded premium types of fuel.

For new engines, the most satisfactory results are obtained by using nonleaded gasoline. For older engines that have previously used leaded gasoline, heads must be taken off and all lead deposits removed from engine before switching to nonleaded gasoline.

CAUTION **If lead deposits are not removed from engine before switching from leaded to nonleaded gasoline, preignition could occur causing severe damage to the engine.**

OIL

Check oil level daily (see Figure 2). Be sure unit is level when checking oil. Add oil to top of fill hole if required. See *MAINTENANCE* section of this manual for type of oil, oil viscosity and crankcase capacity.

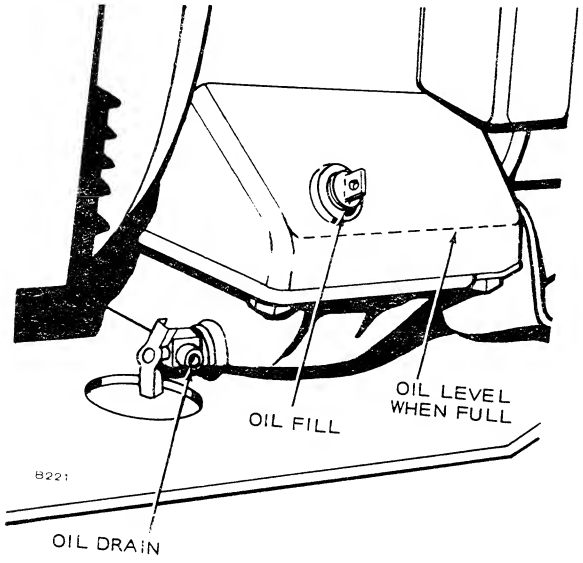


FIGURE 2. OIL LEVEL

STARTING AND STOPPING

Push toggle start switch to the right to crank the engine. When engine starts, release the switch. Allow the set to warm up before applying a load.

To stop engine, push the toggle switch to the left. If the set has been running with a full load connected, disconnect the load and allow the set to run for a few minutes before pushing stop switch.

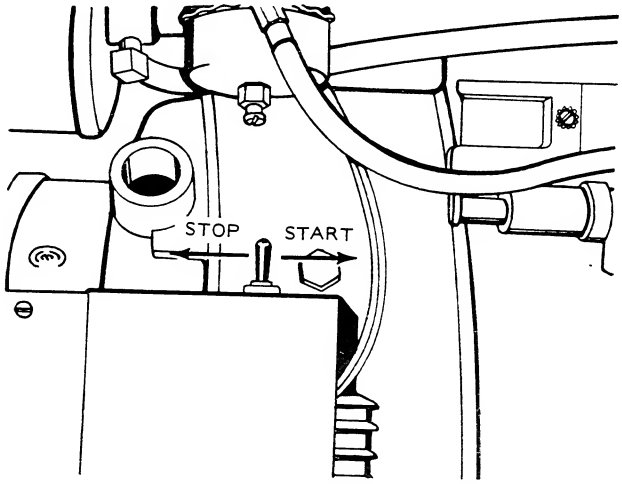


FIGURE 3. START-STOP SWITCH

Automatic Choke

An electric choke provides proper choking for starting and running the generator set.

APPLYING LOAD (Break-In)

When applying the load to a new or reconditioned set, it should be applied gradually in about four steps; each step of not less than 30 minutes running time. Start with 1/4 load, then 1/2, 3/4 and full load.

BATTERY CHARGING

The unit has a battery-charging circuit to charge the battery when the generating set is running.

WARNING **DO NOT DISCONNECT BATTERY CABLES FROM BATTERY WHILE GENERATOR SET IS CRANKING OR RUNNING; SPARKS MAY CAUSE AN EXPLOSION.**

SET EXERCISING

Establish an exercise program if unit is not used for long periods of time. Start and run unit, with a full load connected if possible, for at least 30 minutes every week. This exercise program will:

- Lubricate internal engine parts.
- Assure proper starting when set is needed.
- Remove moisture.
- Keep carburetor filled with fuel.
- Bring engine up to operating temperature.
- Recharge battery.

ELECTRICAL OUTPUT

The generator set's wiring provides for 120 volts, with the total electrical load not to exceed 23 amperes.

CAUTION **Do not install any outlets between generator and distribution panel.**

POWER REQUIREMENTS FOR APPLIANCES

APPLIANCE OR TOOL	APPROXIMATE RUNNING* WATTAGE
Refrigerator	600-1000
Electric broom	200-500
Coffee percolator	550-700
Electric frying pan	1000-1350
Hair dryer	350-500
Electric stove (per element)	350-1000
Electric iron	500-1200
Radio	50-200
Electric water heater	1000-1500
Space heater	1000-1500
Electric blanket	50-200
Television	200-600
Electric drill	250-750
Battery Charger	Up to 800
Electric water pump	500-600
Air Conditioner	1600-2000
Converter	300-350

* - Starting wattages for motors can be three to four times more than the approximate running wattages.

HIGH OPERATING TEMPERATURE CONDITIONS

1. See that nothing obstructs air flow to and from the set.
2. Keep cooling fins clean. Air housing should be properly installed and undamaged.
3. Keep ignition timing properly adjusted.

LOW OPERATING TEMPERATURE CONDITIONS

1. Use correct SAE oil for temperature conditions. Change oil only when engine is warm. If an unexpected temperature drop causes an emergency, move vehicle to a warm location.
2. Use fresh gasoline. Protect against moisture condensation. Below 0°F (-18°C), adjust carburetor main jet for a slightly richer fuel mixture.
3. Keep ignition system clean, properly adjusted and batteries in a well charged condition.
4. Partially restrict cool airflow, but use care to avoid overheating.

EXTREMELY DUSTY AND DIRTY CONDITIONS

1. Keep unit clean. Keep cooling surfaces clean.
2. Service air cleaner as frequently as necessary.
3. Change crankcase oil every 50 operating hours.
4. Keep oil and gasoline in dust-tight containers.
5. Keep governor linkage clean.
6. Clean generator brushes, slip rings, and commutator; *do not* remove normal dark brown film. Do *not* polish.

HIGH ALTITUDE OPERATION

For operation at altitudes of 2500 feet (775 m) above sea level, close carburetor main jet adjustment slightly to maintain proper air-to-fuel ratio (refer to the *ADJUSTMENTS* section). Maximum power will be reduced approximately four percent for each 1000 feet (310 m) above sea level after the first 1000 feet.

WARNING **Do not use discharged air from blower scroll for compartment heating. Poisonous gas fumes may be present.**

OUT-OF-SERVICE PROTECTION

Protect a generator set that will be out of service for more than 30 days from damage caused by rust or corrosion. Use the following procedure to properly protect the set.

1. Run the generator set with at least a 50 percent load until thoroughly warm (usually about 1 hour).
2. Turn off fuel supply and allow the engine to run out of fuel. Also operate the choke manually as the engine stops to help drain the carburetor completely.
3. Drain the oil from oil base while engine is still warm. Replace the oil filter if so equipped. Replace drain plug and refill. Attach a warning tag stating type and viscosity of oil used.
4. Remove spark plugs. Pour 1 ounce of rust inhibitor oil (or SAE #10) into each cylinder. (Spray cans work well for this application.) Turn engine over by hand at least 2 complete revolutions. Replace the spark plugs.
5. Replace the air cleaner at least on an annual basis.
6. Plug the exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
7. Clean and oil all exposed engine parts including carburetor and governor linkage.
8. Wipe generator brushes, slip rings, housing, etc. Do not apply any lubricant or preservative.
9. Remove the battery and store in a cool dry place. Coat the battery terminals and cable connections with vasoline or grease to prevent any corrosion. Recharge the battery at least monthly or maintain with a trickle type battery charger.

10. Provide a suitable cover if the unit is exposed to the elements.

RETURNING THE UNIT TO SERVICE

1. Remove the cover and all protective wrapping. Wipe the oil film off all exposed engine parts. Remove the plug from the exhaust outlet.
2. Visually inspect the unit for any damage. Check to be sure the carburetor and governor linkage are free. Remove the generator end bell band and check to be sure the brushes work freely in their holders.
3. Check the tag to ensure oil of the proper brand and grade has been installed. Check the oil level.
4. Install the battery (be sure battery is fully charged), observing proper polarity. Ground is negative.
5. Remove spark plugs, clean and gap. Turn the engine over by hand several times. Reinstall spark plugs.
6. Remove all load and start the generator set at the unit. Initial start may be slow due to oil or rust inhibitor in the cylinders. Excessive smoke and rough operation will occur until the oil or rust inhibitor is burned off.
7. Apply a 50 percent load after the set runs smooth. Allow the generator set to warm up (1 hour) with the load connected. Check speed and voltage.
8. Unit is now ready for service.

ADJUSTMENTS

TIMING AND BREAKER POINTS

Ignition points should break contact at 22° BTC (see Figure 4). Proper 22° BTC timing is obtained by setting breaker points and checking with a timing light.

22° BTC timing can be checked at timing hole on the front of blower housing ("D") or at another timing hole on the side of the blower housing ("C") just above the governor adjustment. Breaker point setting may vary from .017-.024 inch to get proper 22° BTC timing.

1. Turn engine over slowly in a clockwise direction until the TC mark appears in the middle of the window "D" (Figure 4). Turn slightly beyond this point to ensure points are fully open.
2. Remove cover on breaker point box, loosen screws "A" and turn cam "B" to obtain .020 inch setting. Use a clean, flat feeler gauge.
3. Retighten screws "A", replace breaker box cover and connect a timing light. With unit running and warmed up, notch should appear in timing reference hole "C". (If front of blower scroll is accessible, direct the timing light to small hole "D". 22° BTC mark should appear in this hole.)

CARBURETOR

Initial Adjustment

Adjust initially by turning idle and main (load) adjustment screws gently onto their seats. Then back off idle screw 1-1/4 turn and main screw 1-1/4 turns. This adjustment will allow initial starting of the generator set.

Adjustment

1. Start unit and allow it to warm up.
2. Remove all AC loads from the generator set.
3. Connect a voltmeter to the AC leads or use a plug-in voltmeter inserted into one of the receptacles. Hold governor arm to minimum speed and adjust the throttle stop screw so voltmeter indicates 75-80 volts.
4. With voltmeter still connected, hold governor arm against throttle stop and turn idle adjustment screw in until voltage drops. Then turn it out until the highest voltage is obtained. Release governor arm. Engine should accelerate to governed speed and become stable.

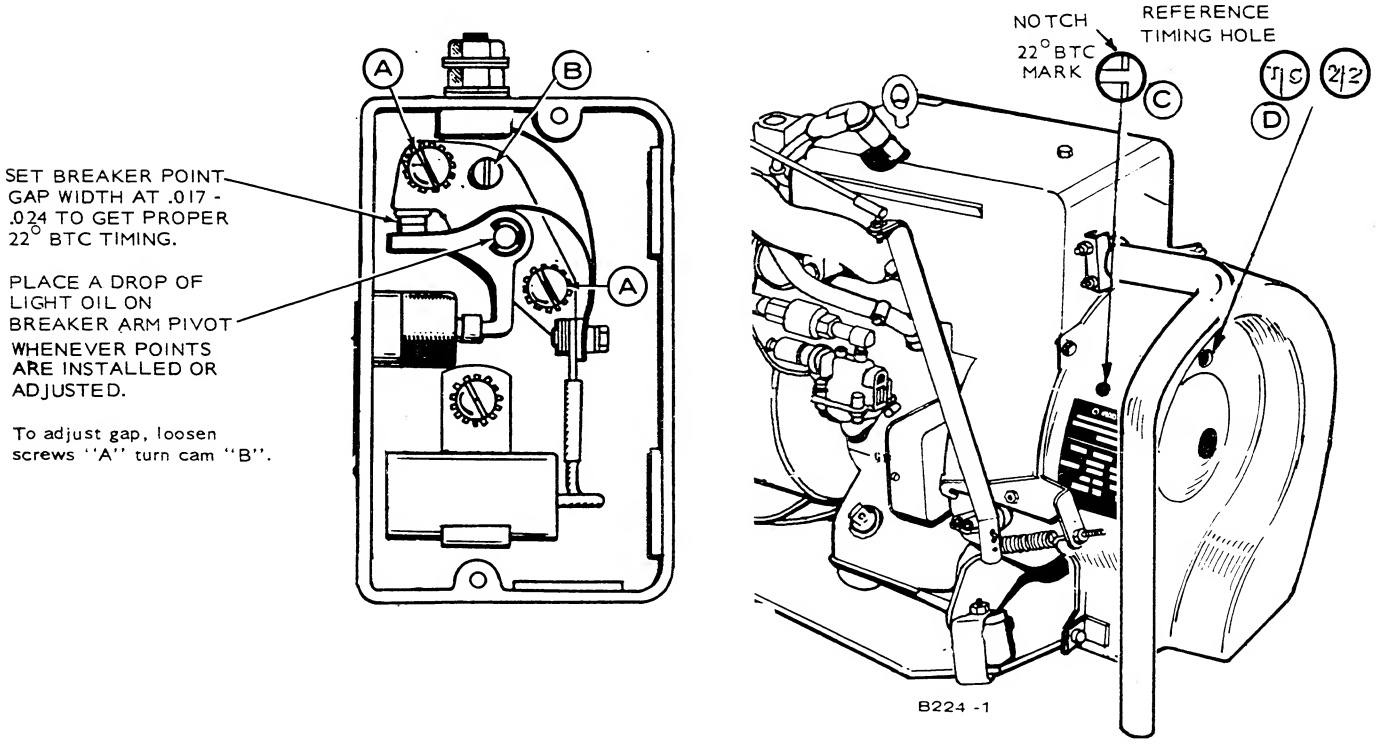


FIGURE 4. IGNITION AND TIMING ADJUSTMENTS

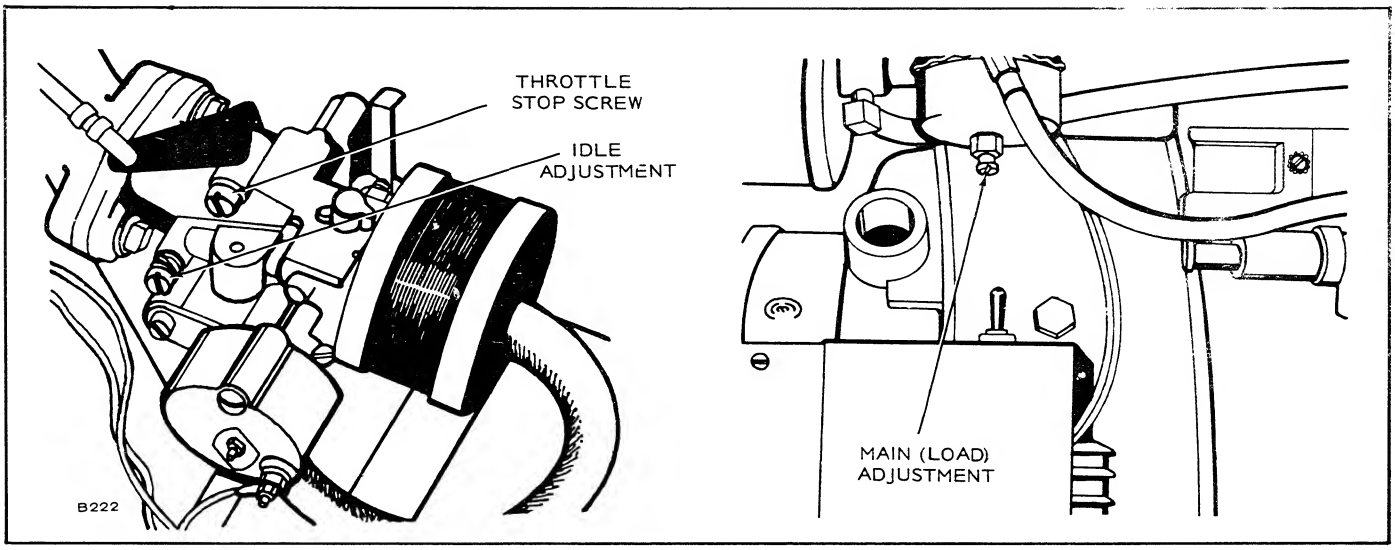


FIGURE 5. CARBURETOR ADJUSTMENTS

5. Connect a full rated load to the generator set. (Use RV appliances or Onan load test panel.)
6. Adjust main (load) adjustment screw to get the highest voltage. Remove load and hold governor arm to minimum speed. Release governor arm and observe acceleration. If surging occurs at governed speed, open the main jet slightly. If surging continues, adjust governor sensitivity.

Some units do not have a main (load) adjustment. Setting is factory fixed.

ELECTRIC CHOKE

Normal choke setting is 1/8 inch from its fully closed position at 70°F. If temperature changes occur, requiring choke adjustment, proceed as follows:

1. Loosen two outer screws at "A" (Figure 6).
2. Turn the cover assembly counterclockwise to decrease choking (leaner mixture).
3. To increase choking (richer mixture), turn cover assembly clockwise.
4. Tighten both screws to lock cover in place.

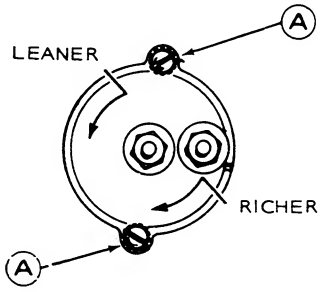


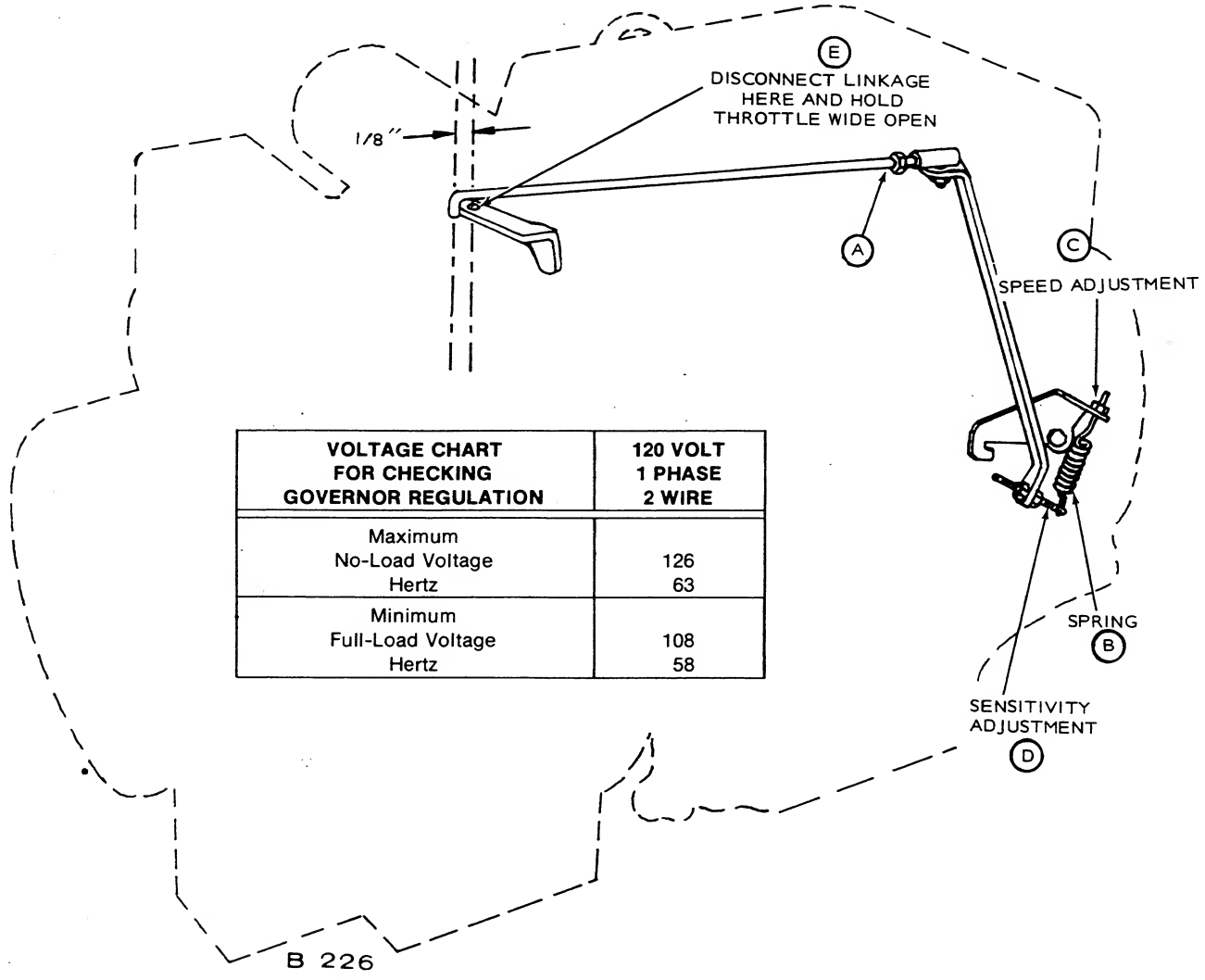
FIGURE 6. ELECTRIC CHOKE ADJUSTMENT

GOVERNOR

The governor controls engine speed by opening or closing the throttle according to the load taken off the set (Figure 7). The engine speed also determines voltage and frequency of the generator current. Before readjusting the governor linkage, check for binding at the linkage or throttle.

1. With unit stopped, disconnect governor control rod from hole (E) on throttle shaft. While holding throttle wide open, adjust length of governor control rod so center-to-center distance is 1/8 inch. Change governor control rod length by turning the threaded rod (A) near the ball joint. When 1/8 inch distance is reached, reconnect rod at point E.
2. Run the set with a load to thoroughly *warm it up.*
3. Connect a voltmeter across the generator output. With the set operating at no load, adjust the speed nut (C) until voltmeter reads 126 volts. When a full rated load is applied, voltage should not fall below 110 volts.
4. If voltage falls below 108 volts (with full load), loosen the hex nuts on sensitivity spring stud and screw stud (D) inward (clockwise) or recheck step 1. If voltage is within limits, but tends to surge (alternately increases and decreases), turn the spring stud outward (counterclockwise) until voltage stabilizes.
5. Retighten nuts on lower spring stud while holding stud in position with a screwdriver.

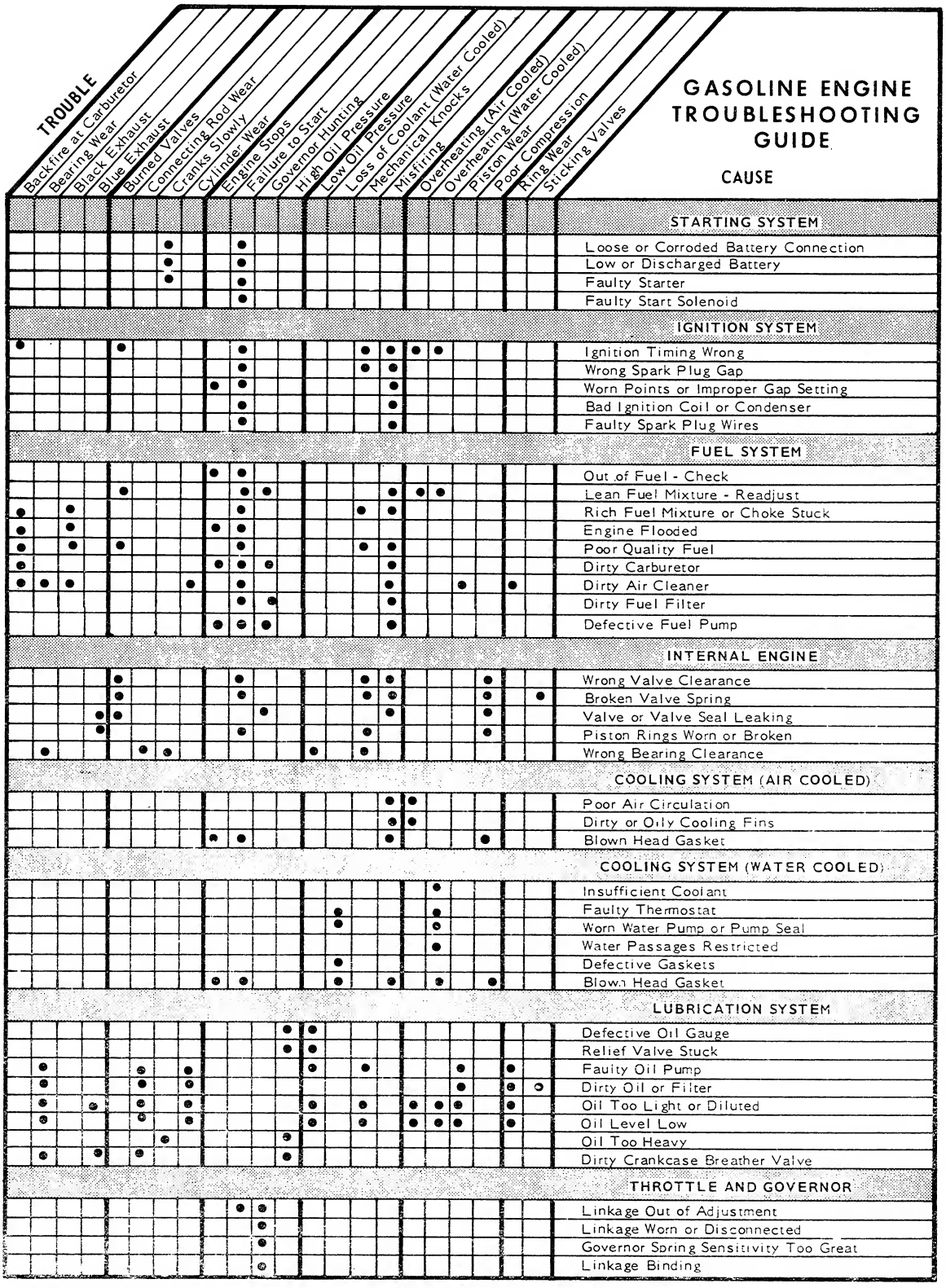
Turning sensitivity stud (D) in or out, usually requires a corresponding change in speed adjustment nut (C). Table in Figure 7 shows proper voltage speed and frequency ratings.



VOLTAGE CHART FOR CHECKING GOVERNOR REGULATION	120 VOLT 1 PHASE 2 WIRE
Maximum No-Load Voltage	126
Hertz	63
Minimum Full-Load Voltage	108
Hertz	58

FIGURE 7. GOVERNOR ADJUSTMENTS

ENGINE TROUBLESHOOTING GUIDE



MAINTENANCE

Regularly scheduled maintenance is the key to lower operating costs and longer service life for the unit. The following schedule can be used as a guide. However, actual operating conditions under which a unit is run should be the determining factor in establishing a maintenance schedule. When operating in very dusty or dirty conditions, some of the service periods may have to be reduced. Check the condition of the crankcase oil, the filters, etc. frequently until the proper service time periods can be established.

For any abnormalities in operation, unusual noises from engine or accessories, loss of power, overheating, etc., contact your nearest dealer.

WARNING **Always allow generator set to cool off before performing any maintenance or installation work on the set. Working on a hot set could cause severe burns.**

PERIODIC MAINTENANCE SCHEDULE

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS				
	8	50	100	200	400
General Inspection	x1				
Check Oil Level	x				
Check Battery Water Level		x2			
Blow Out Generator with Dry Air		x2			
Change Crankcase Oil (10W40)		x2			
Replace Air Cleaner			x2		
Replace Spark Plug—Gap .025"			x3		
Clean Crankcase Breather			x2		
Tune-Up				x4	
Check Breaker Points				x4	
Check Ignition Timing				x4	
Clean Cooling Fins				x2	
Remove Carbon & Lead from Cylinder Head				x4	
Adjust Tappets					x4
Replace Fuel Filter			x		
Check Generator Brushes (Replace if Necessary)	As Required				

x1 - Check for exhaust leaks, fuel leaks, proper mounting, etc.
x2 - Perform more often in extremely dusty conditions.
x3 - Replace at beginning of season or every 100 hours.
x4 - For detailed maintenance, contact your nearest authorized Onan Service Center.

OIL LEVEL

Check the oil level daily or at least every eight operating hours. Oil should just start to overflow from fill hole when crankcase is full.

Check oil when set (or vehicle) is level.

OIL CHANGE

The oil drain valve is located on bottom of oil base, below fill plug. Change oil initially at 25 operating hours; change every 50 hours after that. Extremely dusty conditions require more frequent oil changes.

The engine's oil capacity is 1.1 quart. Don't mix brands nor grades of motor oil. Use a good quality (SE/CC designated) oil and stick with it. Keep an extra quart of oil (same brand and grade) handy for adding oil between changes.

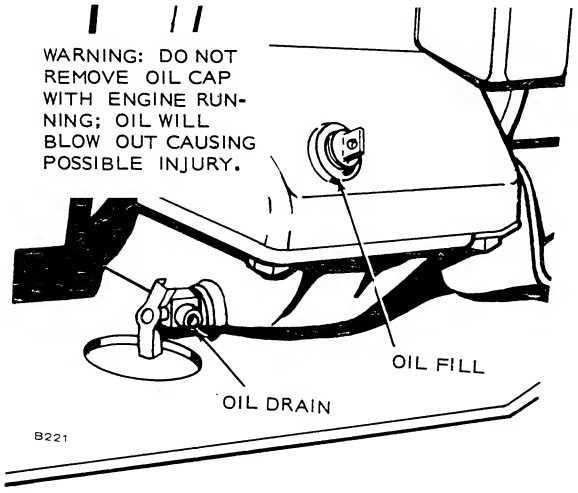


FIGURE 8. OIL FILL AND DRAIN

FUEL FILTER

An inline fuel filter mounts on inlet side of fuel pump. Replace at least every 400 hours or when poor performance is suspected.

CAUTION **When removing or replacing fuel solenoid always use wrench on hex (A), Figure 9. Do not exert turning force on B because solenoid will be damaged internally.**

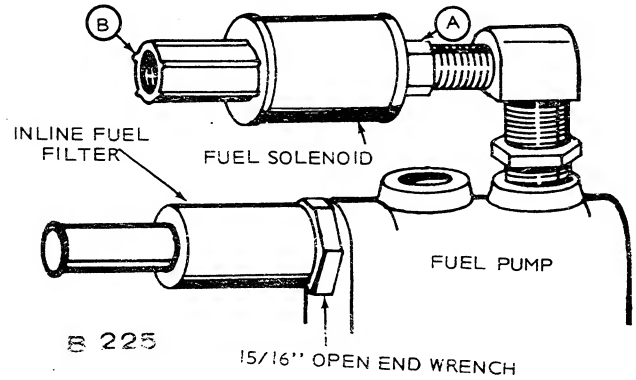


FIGURE 9. INLINE FUEL FILTER

FUEL SOLENOID

Evaporative control systems on late model motor homes require a positive fuel shutoff valve to prevent the generator set from flooding when not in use.

WARNING **Do NOT use unvented batteries with this generator set. Malfunction of the starting-charging system can produce high charging currents, causing excessive gassing. An unvented battery can build up sufficient pressure to explode.**

AIR CLEANER

Replace air cleaner every 100 hours (sooner in dusty conditions). Element used is a dry type and requires no oil. Some dirt can be removed by tapping element against a flat surface.

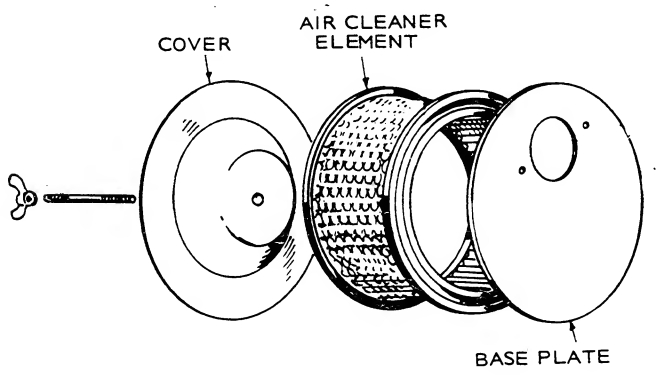


FIGURE 10. AIR CLEANER ELEMENT

BATTERY CARE

To increase battery life, the operator can perform a number of routine checks and some preventive maintenance.

1. Keep the battery case clean and dry.
2. Make sure the battery cable connections are clean and tight. Use a terminal puller when removing cables for any reason.
3. Coat the battery terminals with a mineral grease or petroleum jelly to reduce corrosion and oxidation.
4. Identify each battery cable to be positive or negative before making any connection. Always connect the ground (negative) cable last.
5. Maintain the electrolyte level by adding water (drinking quality or better) as needed for filling to split level marker. The water ingredient of the electrolyte evaporates, but the sulphuric acid ingredient remains. Therefore, add water, not electrolyte.
6. Avoid overcharging when recharging. Stop the boost charge when the specific gravity is 1.260 and the electrolyte is 80°F (26.7°C).

GOVERNOR LINKAGE

Check linkage periodically for freedom of movement. Disconnect ball joint and clean.

SPARK PLUG

Replace spark plug every 100 hours or at least once a year. A badly leaded plug will cause misfiring, poor operation or stopping when a load is applied.

- Black deposits indicate a rich mixture.
- Wet plug indicates misfiring.
- Badly or frequently fouled plug indicates the need for a major tune-up.

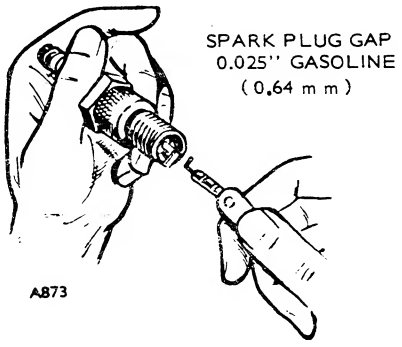


FIGURE 11. SPARK PLUG GAP

COOLING SYSTEM

Check cooling fins and shrouds at least every 200 hours or annually. Remove all foreign material (bugs, dirt, oil, leaves). Also check generator air inlet and air outlet for restrictions which can cause overheating.

CAUTION **Don't operate unit without the cooling shrouds installed; overheating will occur causing engine damage.**

BREATHER VALVE

Every 100 hours check the breather valve by removing breather tube and examining the valve in the crankcase. The ball-check valve must move freely in the valve housing chamber. If there is any excessive accumulation of sludge or dirt, replace the breather valve.

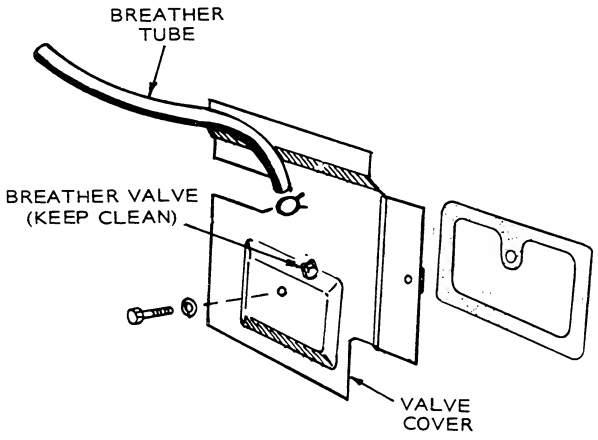


FIGURE 12. CRANKCASE BREATHER

GENERATOR

After approximately 500 hours of operation, remove the generator brushes and inspect for wear and scoring. To remove the brushes, unscrew the brush retainers (Figure 13) and pull the brush and spring assembly out of the bell housing. The four smaller retainers hold the slip ring brushes, and the two larger retainers secure the commutator brushes.

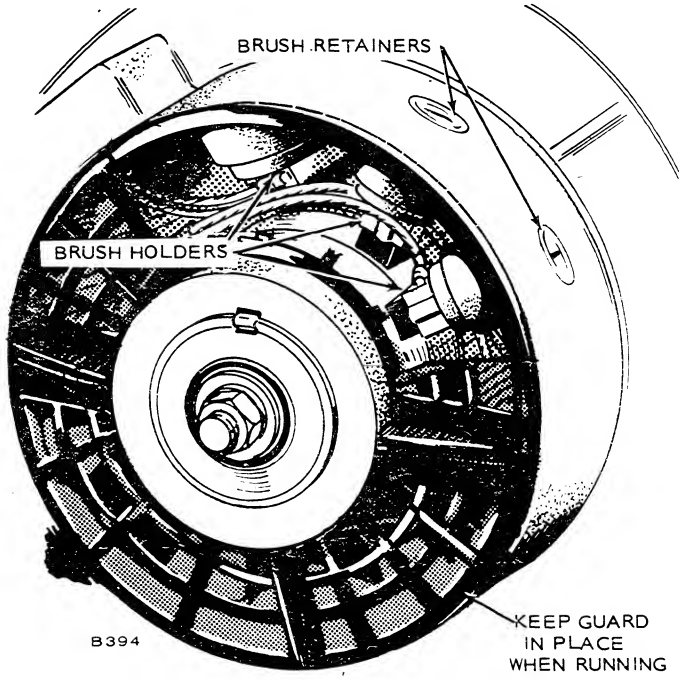


FIGURE 13. BRUSH LOCATION

The brush faces should have a smooth, shiny surface to them, with no deep grooves present. If serious grooves are noted, the commutator and slip rings should be inspected to determine the cause for correction purposes. If slip ring and commutator dressing is required, your nearest Onan Service Center is best equipped to handle the job.

If brushes appear to be in satisfactory condition, and are at least 5/8 inch in length, replace them in the holders from which they were removed. Work the brushes up and down in the holders to be sure there is no sticking or binding. If they bind, clean out the holders with air pressure or a small bristle brush until the brushes slide freely in the holders. Replace the brush retainer screws.

If brushes are worn to less than 5/8 inch length, replace with new brushes (see Figure 14).

Every 500 hours, remove the brushes and blow out the dust in the generator by blowing compressed air (not over 35 psi) into all the brush holders with the brushes removed. Service more often if operating in extremely dusty conditions.

Replacement brushes are shaped to fit the curvature of the commutator and seldom need sanding to seat properly. If sparking does occur, run set at light loads until new brushes are properly seated.

CAUTION **Never use emery cloth or metal files to seat brushes. Use only brushes of correct part number (see your Onan Service Center). Replace brushes in the same position in holder as they were originally.**

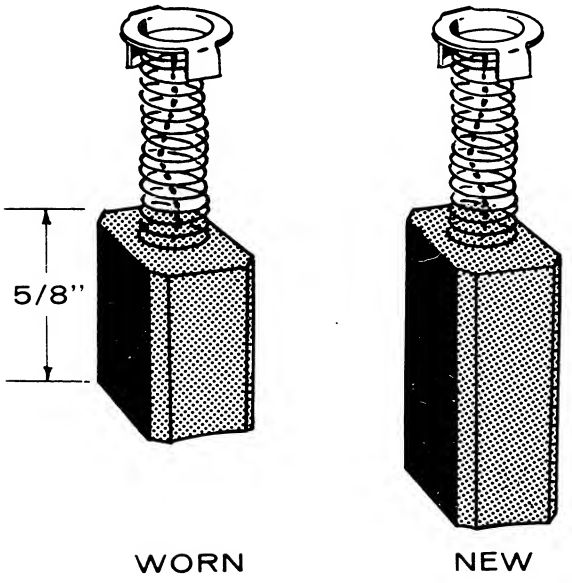


FIGURE 14. BRUSH REPLACEMENT

EXHAUST SPARK ARRESTER

Exhaust spark arresters are necessary for SAFE OPERATION. All require periodic clean-out (every 50 to 100 operating hours) to maintain maximum efficiency. Some state and federal parks require them.

Remove pipe plug in bottom of muffler. Run set for 5 minutes. Replace plug.

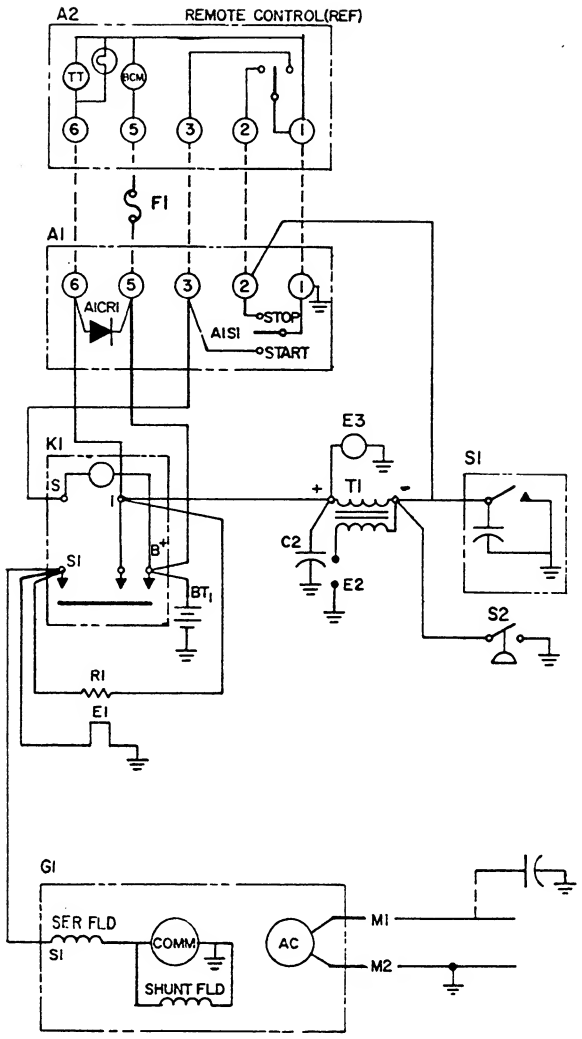
CONTROL TROUBLESHOOTING

CRANKS SLOWLY	CRANKS - NO START	FAILS TO CRANK	RUNS A SHORT TIME	RUNS AND SURGES	STOPS	ELECTRO-MECHANICAL AND CONTROL TROUBLESHOOTING GUIDE PROBABLE CAUSE	STEP
•		•				Bad Battery Connection	1
•		•				Low Battery	2
	•	•				Faulty Start Solenoid	3
	•					Faulty Fuel Solenoid	4
	•				•	Faulty Ignition	5
	•					Faulty Low Oil Pressure Switch	6
			•	•	•	Faulty Choke	7
	•		•		•	Low Oil Level	8
				•		Governor Out of Adjustment	9

1. Clean and tighten all battery and cable connections.
2. Check specific gravity. Recharge or replace battery if necessary.
3. Push start switch. Check K1-1 terminal voltage to ground. Check K1-S1 contacts to ground. Battery voltage should appear at these terminals; if not, replace solenoid.
4. Fuel solenoid must open during cranking and running. Check by removing flexible fuel hose from carburetor and crank engine. If fuel solenoid is open, fuel will pulsate out of this hose. If it does not, the fuel solenoid and fuel pump must be checked separately to determine defective part.

WARNING **Use extreme care for this test. Direct fuel flow into a suitable container and make sure area is well ventilated to prevent accumulation of gasoline fumes.**

5. Check to see if points open and close during cranking. If they do not open and close, adjust and set points. Plug and plug wires must be in good condition. Voltage at ignition coil negative terminal (-) must alternate from +12 volts to zero volts as points open and close during engine cranking.
6. Remove wire lead from low oil pressure switch. With proper oil level in engine, crank and run engine. Replace wire lead to low oil pressure switch. Engine must continue to run when the wire lead is re-connected. If it does not, replace low oil pressure switch.
7. With engine not running, check choke vane movement by pushing choke lever arm. Choke must be in closed position with cold engine, and must be free to move against bi-metal spring. As engine warms up, bi-metal spring relaxes and allows choke vane to open fully. The lever will pulsate as engine warms up. See *ADJUSTMENT* section.
8. Check oil level. If low or empty, refill to proper level.
9. Readjust governor.



A1	Control
A1S1	Toggle Switch
A2	Remote Control (Opt.)
BCM	Battery Condition Meter
BT1	Battery
E1	Electric Choke
E2	Spark Plug
E3	Fuel Solenoid
F1	5 Amp Fuse (Opt.)
G1	Generator
K1	Start Solenoid
M1	Generator (Hot) Lead
M2	Generator (Grd.) Lead
R1	Resistor (10-Ohm, 45W)
S1	Breaker Points
S2	Low Oil Pressure Switch
T1	Ignition Coil
TT	Time Totalizer (Opt.)

F1 = Fuse (5 Amp) to be supplied by customer to protect against accidental grounding.

FIGURE 15. CONTROL SYSTEM SCHEMATIC

REMOTE ACCESSORIES

INSTALLING REMOTE CONTROL (300-0985)

This control includes a start-stop switch with an indicator lamp. Install as follows:

1. Select switch location. Using Figure 16 as a guide, drill screw holes and cut holes in RV panel.
2. Following national and local electrical codes and using four insulated wires of predetermined length (#18 or larger), connect remote switch to terminals on generator.

CAUTION **Ensure that leads from remote switch connect with corresponding terminals on generator terminal board.**

CAUTION **Don't route DC wires for remote control through conduit containing AC load wiring. Induced voltages may cause erratic operation.**

3. Insert remote switch in hole cutout and secure with two #5 woodscrews supplied with switch.

WARNING **Seal all holes that might allow noxious gases from generator set into motor home.**

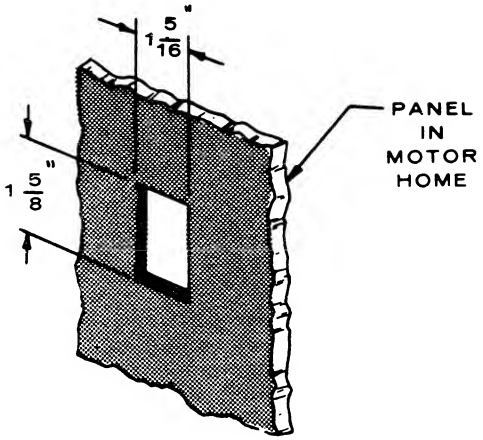
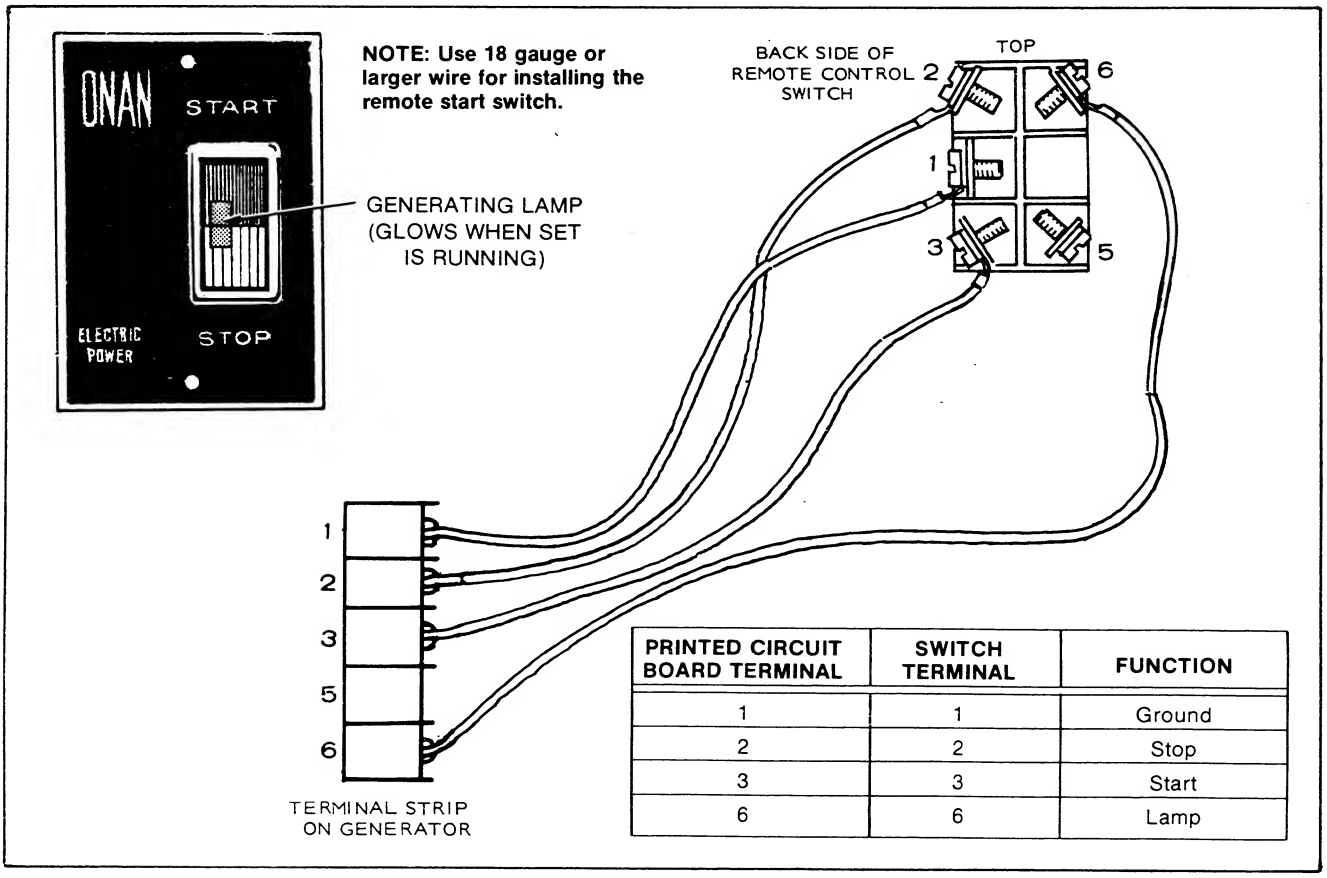


FIGURE 16. MOTOR HOME CUTOUT



PRINTED CIRCUIT BOARD TERMINAL	SWITCH TERMINAL	FUNCTION
1	1	Ground
2	2	Stop
3	3	Start
6	6	Lamp

FIGURE 17. CONNECTING REMOTE CONTROL (300-0985)

INSTALLING DELUXE REMOTE CONTROL (300-0986)

This control includes a start-stop switch with an indicator lamp, a running time meter and a battery condition meter. Install and connect as follows:

1. Select control location. Using Figure 18 as a guide, drill screw holes and cut hole to accommodate remote switch in panel.
2. Following national and local electrical codes and using five insulated wires of predetermined length (#18 or larger), connect remote control to terminals on generator. Ensure that leads from remote control connect to corresponding terminals on generator terminal board.

CAUTION **Don't route DC wires for remote control through conduit containing AC load wiring. Induced voltages may cause erratic operation.**

3. Insert remote control in hole cutout and secure with four #5 woodscrews supplied with switch.

WARNING **Seal all holes that might allow noxious gases to enter motor home.**

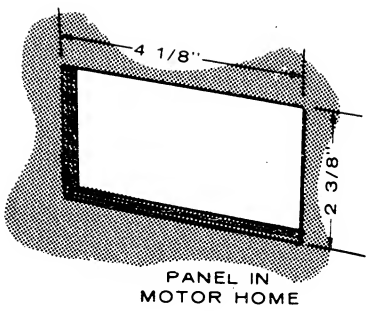
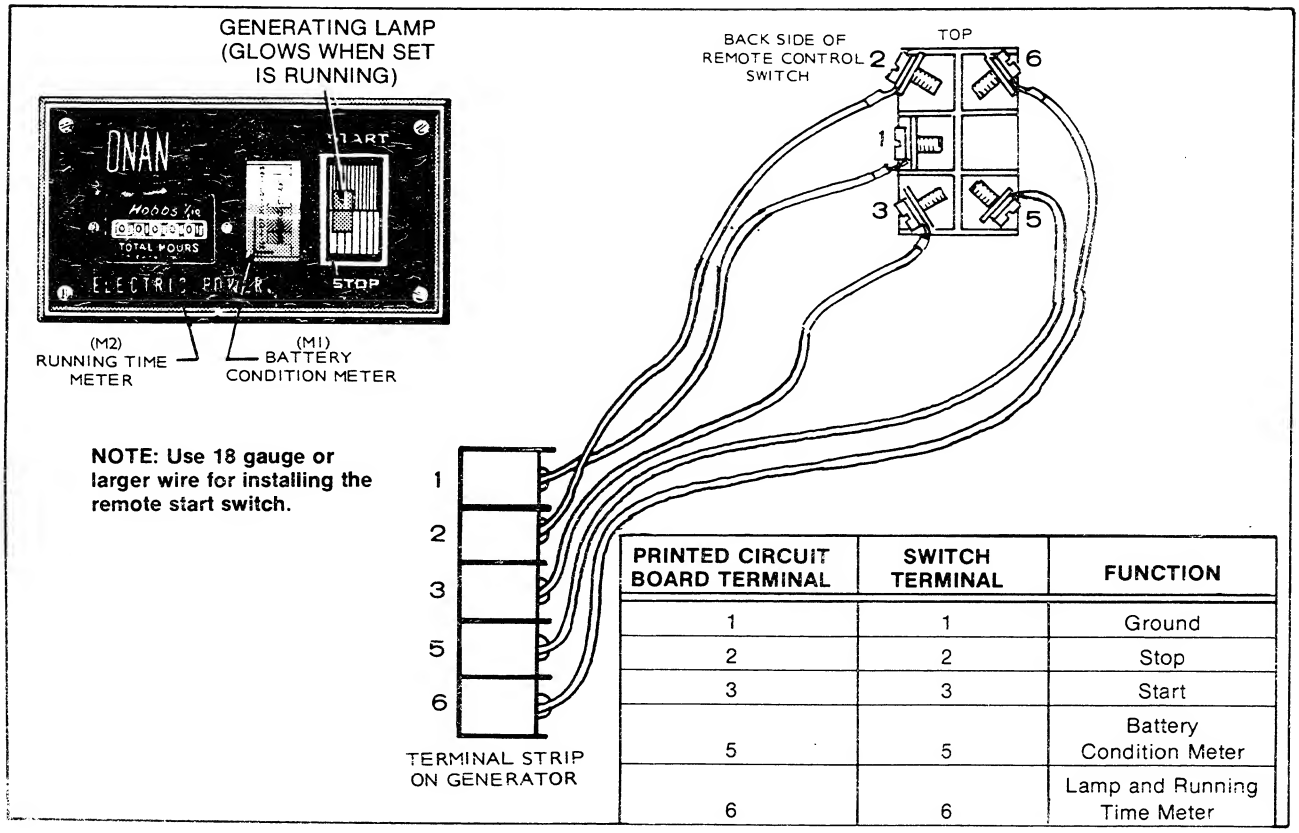


FIGURE 18. MOTOR HOME CUTOUT



PRINTED CIRCUIT BOARD TERMINAL	SWITCH TERMINAL	FUNCTION
1	1	Ground
2	2	Stop
3	3	Start
5	5	Battery Condition Meter
6	6	Lamp and Running Time Meter

FIGURE 19. CONNECTING DELUXE REMOTE CONTROL (300-0986)

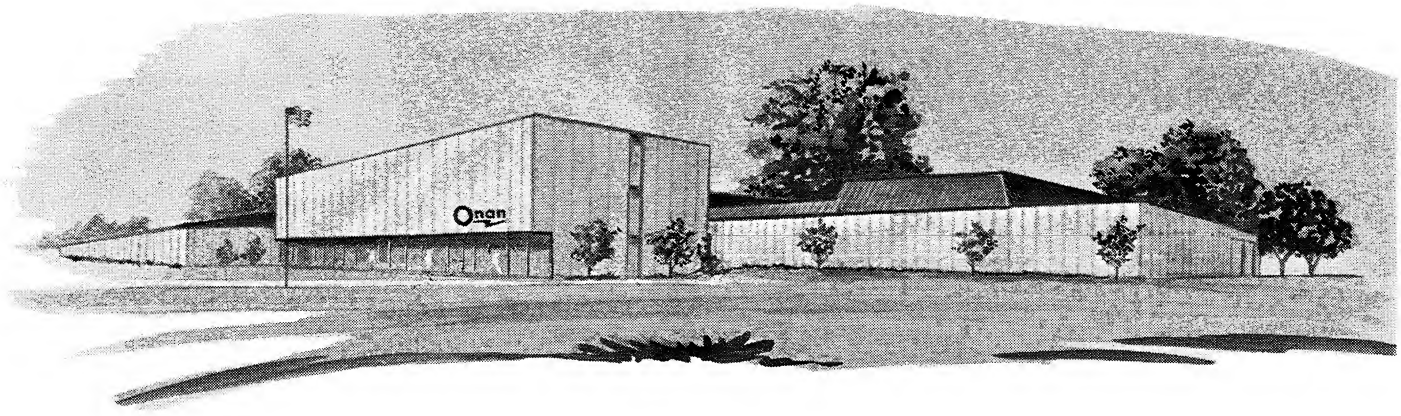
"RV" PARTS INFORMATION

For additional information on parts or service contact your nearest authorized Onan dealer or Service Center. A complete parts manual is available and may be ordered under #924-0220.

The following Running Replacement parts list consists of external items which may require replacement due to normal wear and service and can usually be installed by the operator.

RUNNING REPLACEMENT PARTS LIST

Part No.	Description
140-1188	Air Cleaner Element
167-0251	Spark Plug
160-0002	Breaker Points
312-0181	Condenser (Breaker Points)
166-0278	Ignition Coil
146-0191	Carburetor
146-0149	Carburetor Gasket Kit
123-0486	Breather Valve
214-0100 (DC)	Generator Brushes
214-0092 (AC)	Generator Brushes
307-0845	Start Solenoid
307-1279	Fuel Solenoid
402-0388	Vibration Isolators
149-1353	Fuel Filter (In Line)



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